

Attorney Docket No. 88742.472005  
(formerly TUEC.IP2005)  
Customer No. 24347

AMENDMENT AND RESPONSE  
TO OFFICE ACTION  
SERIAL NO. 09/427,775

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**REMARKS**

This Application has been carefully reviewed in light of the Office Action mailed May 22, 2002. Claims 1-5, 7-17, 24-25, 27-50, 52-62, 64-88, 90-103, 105, 111-114, 117-129, and 132 were pending in this Application prior to this Amendment and Response. Claims 69, 83 and 84 have been cancelled herein, without prejudice or disclaimer, and Claims 1, 2, 3, 7, 13, 14, 27, 52, 54, 64, 65, 66, 102, 118, 119, 120, 121, 122, 123, 125 and 129 have been amended. Exhibit B provides an edited version of the amended Claims, and highlights all such amendments. Thus, Claims 1-5, 7-17, 24-25, 27-50, 52-62, 64-68, 70-82, 85-88, 90-103, 105, 111-114, 117-129, and 132 are now pending in this Application.

Applicants have made various minor amendments to the Specification to correct typographical and grammatical errors. Applicants note that these amendments did not introduce any new matter into the Specification and such minor amendments were not made for reasons of patentability. Applicants further note that all such amendments were made for stylistic reasons and all amendments were made with clear support and, in some cases, to make explicit what was already implicit in the Specification. As such, no estoppel or other adverse effect should attach to these amendments, and Applicants respectfully request that these amendments be entered. Please note that the attached Exhibit A provides an edited version of the changes to the Specification, and highlights all such amendments.

Applicants previously submitted formal drawings of FIGURES 1-6 in their prior Amendment and Response to Office Action Mailed July 5, 2001. Applicants, once again, request approval of these drawings by the Examiner and the Official Draftsman. If additional copies of these formal drawings are needed, please contact the undersigned.

**CLAIM AMENDMENTS AND REJECTIONS BASED ON 35 U.S.C. § 103**

Applicants appreciate the Examiner taking the time to conduct a teleconference with Applicants' legal representative on August 21, 2002, where agreement was reached on claim language that would be acceptable to the Examiner. In particular, Applicants, through amendments to independent Claims 1 and 129, have clearly distinguished their invention from any cited references, indicated how a plasma is formed, what surface is being plated, and the how such a plated surface may be used. For example, independent Claims 1 and 129 both generally recite the following limitations:

**a substrate with a threaded surface**

**to create a plated threaded surface**

**wherein the plated threaded surface reduces galling  
between the plated threaded surface and a surface of a  
mated component**

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None of the cited references teach, describe or suggest the limitations recited above as claimed in independent Claims 1 and 129. Independent Claim 1 further recites the following limitation:

**the depositant includes at least a first metal**

Just as with the limitations mentioned above, none of the cited references teach, describe or suggest such a limitation as recited in independent Claim 1.

Because independent Claims 1 and 129 are the only remaining independent claims, all remaining dependent claims depend, either directly or indirectly, from one of these two independent claims. As such, all of the presently pending claims are patentably distinct from all cited references, including, without limitation, US Patent No. 5,078,847 to Grosman et al., US Patent Nos. 3,857,682; 4,039,416; 4,054,426; RE 30,401; 4,342,631; 4,420,386; 4,468,309; 4,673,586; 4,667,620; 4,826,365; 5,252,365 to White, US Patent No. 3,329,601 to Mattox, US Patent No. 4,938,859 to Ide et al., US Patent No. 4,282,597 to Yenawine et al., US Patent No. 4,725,345 to Sakamoto et al., US Patent No. 4,990,233 to Hahn, and US Patent No. 4,137,370 to Fujishiro et al. The various differences highlighted in Applicants prior response provides additional claim limitations that are not taught or suggested, either alone or in combination, by any of these references.

Applicants respectfully submit that all claim amendments made herein were not intended to narrow the scope of the claims

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in response to a patentability rejection, but instead were made to make explicit what was already implicit and to further clarify what Applicants believe were already explicit in the claims before amendment. As such, none of the amendments made herein should be construed to estop or limit Applicants capability, in any manner, to the full scope of equivalents for all limitations of all claims in this Application under the Doctrine of Equivalents.

**OBJECTIONS AND REJECTIONS BASED ON 35 U.S.C. § 112**

The Examiner objected to and/or rejected Claims 1-17, 24, 25, 27-50, 52-62, 64-88, 90-103, 105, 111-114, 117-129 and 132 based on 35 U.S.C. § 112, ¶ 2 "as being indefinite." As discussed herein and as provided by the various amendments to the claims, Applicants have overcome these objections and rejections and earnestly seek full allowance of these claims.

Applicants, once again, respectfully traverse the Examiners rejection of Claims 34-39, 42-47, 53 and 55 based on the allegations of the Examiner that "the words 'base', 'transition' or 'working' is used before 'layer,' however no context in the claims provides these modifiers with any clear or necessary meaning." Applicants note that these terms are clearly defined in the Application in numerous locations throughout and are used in a manner that is clear and unambiguous by providing an added limitation that such layers serve and function as defined and in the relationship to one another as defined in the Specification and Drawings of the Application. Applicants respectfully aver

that these claims comply with 35 U.S.C. § 112, ¶ 2. For example, please see FIGURE 4 and all related discussion in the Specification on pages 19-22, where all of these terms are illustrated, discussed, and their relationship to each other is clearly illustrated.

Similarly, Applicants respectfully traverse the Examiners objection to Claims 36-39, 44-47, 53 and 55 based on the assertion by the Examiner that these claims are in "improper dependent form for failing to further limit the subject matter of a previous claim." The "layer" limitations are clearly defined, illustrated, and provide an added and distinguishing limitation and structure to each of these claims. As such. Applicants respectfully assert that these claims are in proper form.

The Examiner objected to Claims 41-47 and alleged that the term "evaporation source" can refer to more than one evaporation source. Applicants assert that these claim limitations are abundantly clear and the difference between "the evaporation source" and "the second evaporation source" is a entirely clear and unambiguous according to standard patent law claim construction and antecedent basis rules.

The Examiner objected to the term "the total mass" in Claim 49 and alleged somehow that this lacks proper antecedent basis. Mass is an inherent property of all structures and, as such, does not need any antecedent language. As such, Claim 49 is not ambiguous.

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The Examiner incorrectly asserts that Claims 56 and 57, as previously amended, constitute new matter. This is incorrect. Page 30 of the Application includes the following:

The frequency of the radio frequency signal will **generally** be provided at an industrial specified frequency value in either **the kilohertz range or the megahertz range**. Preferably, the frequency signal will be provided at a frequency of 13.56 kilohertz. Although the term radio frequency has been used throughout to describe the generation and application of the radio frequency signal to the substrate, it should be understood that **the term radio frequency should not be limited** to its commonly understood definition of signals having frequencies roughly between 10 kilohertz and 100,000 megahertz. **The term radio frequency shall also include any signal with a frequency component that is operable or capable of assisting with the creation or excitation of a plasma in a vacuum chamber.**

(bold emphasis added). Plainly, this rejection is incorrect, is amply supported by the Specification, and no new matter has been introduced by the amendments to these two claims.

Applicants assert that the term "white metal clean" is clearly defined as well known to one of ordinary skill in the art and hence Claim 61 is not indefinite. Similarly, Applicants strongly contend that the "Steel Structures Painting Structures (SSPC)" is also clearly defined as well known to one of ordinary skill in the art and hence Claims 62-66 are not indefinite. For example, a quick Internet search finds **both** the terms "white metal clean" and "SSPC" in the same document found at <http://www.natare.com/consult/lit/coatings/nalar2000-filter-linings.pdf> . Applicants, however, make no representations and

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have no knowledge regarding this document or its contents, it is cited only as evidence that these terms are readily available and generally known.

The Examiner objected to the use of a slash "/" in the term "silver/palladium" in Claim 102. It is clear from the Specification that the slash is understood to mean "and" and not "and/or" or "or". Thus, this rejection should be withdrawn.

The Examiner objected to the term "amplitude" in Claims 111 and 113 because it allegedly could be confused with "amplitude" in Claim 1. Applicants contend that the term "amplitude" as used before the term voltage or current is completely unambiguous and one of ordinary skill in the art would clearly understand such usage. Further, Applicants contend that the English language could not be contorted in such a case to cause confusion of the usage as provided in Claims 111 and 113.

The Examiner further objected to Claims 117, 120, 122 and 128 based on various claims of lack of antecedent basis, lack of a positive limitation, which is not improper, and the Examiner's confusion as to terms in independent Claim 1. Applicants, similar to what was discussed above, strongly asserts that all of these claims are clear, understandable, not ambiguous, when read in view of the Specification and one of ordinary skill in the light. To force Applicants to change such claim language unfairly deprives Applicants of their desired language to describe their invention in a manner that Applicants believe would be easily understood by one skilled in the art. As such, Applicants respectfully request withdrawal of these objections.

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For all the reasons mentioned above, Applicants respectfully request withdrawal of these objections and rejections. Applicants strongly believes it is entitled to full allowance of all pending claims.

### CONCLUSION

For all the reasons mentioned herein, Applicants respectfully request reconsideration. Applicants submit that the Application is in condition for full allowance of all currently pending claims, and Applicants earnestly seek such full allowance. Should the Examiner have any questions, comments, or suggestions in furtherance of the prosecution of this Application, please contact the undersigned by telephone at 214.979.3027. Applicants, through their attorney, stand ready to conduct a telephone interview with the Examiner to review this Application if the Examiner believes that such an interview would assist in the advancement of this Application.

To the extent that any further fees are required during the pendency of this Application, including petition fees, the Commissioner is hereby authorized to charge payment of any additional fees, including, without limitation, any fees under 37 C.F.R. § 1.16 or 37 C.F.R. § 1.17, to Deposit Account No. 23-3189 of Hunton & Williams (Dallas) and reference Attorney Docket No. 88742.472005. In the event that any additional time is needed for this filing, or any additional time in excess of that requested in a petition for an extension of time, please consider this a petition for an extension of time for any needed



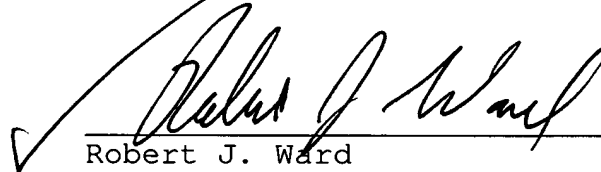
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extension of time pursuant to 37 C.F.R. § 1.136 or any other section or provision of Title 37 of the Code of Federal Regulations. Applicants respectfully request that the Commissioner grant any such petition and authorize the Commissioner to charge the Deposit Account referenced above. Please credit any overpayments to this same Deposit Account.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Robert J. Ward", is written over a horizontal line. To the left of the signature, there is a large checkmark.

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ATTORNEY FOR APPLICANTS

November 22, 2002

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## **EXHIBIT A**

Please substitute the paragraph on page 2, lines 1-14,  
containing the text:

-- BACKGROUND OF THE INVENTION

Various deposition technologies exist for plating and coating materials. These various technologies include, for example, vacuum deposition or physical vapor deposition ("PVD"), chemical vapor deposition ("CVD"), sputtering, and ion plating. All of these deposition technologies suffer from disadvantages such as poor deposition layer adhesion, high cost, generation of environmentally wasteful products that are expensive and cumbersome to dispose, damage to the substrate, elevated substrate temperatures, nonuniform deposition layers, inefficient use of expensive depositants, and inconsistent application of deposition layers are among some of the disadvantages suffered by one or more of the prior deposition technologies. --

and insert in its place the following paragraph:

-- BACKGROUND OF THE INVENTION

Various deposition technologies exist for plating and coating materials. These various technologies include, for example, vacuum deposition or physical vapor deposition ("PVD"), chemical vapor deposition ("CVD"), sputtering, and ion plating. [All of t]  
These deposition technologies suffer from various disadvantages. [such as] These disadvantages may include, for example, poor deposition layer adhesion,

high cost, generation of environmentally wasteful products that are expensive and cumbersome to dispose, damage to the substrate, elevated substrate temperatures, nonuniform deposition layers, inefficient use of expensive depositants, and inconsistent application of deposition layers. **[are among some of the disadvantages suffered by one or more of the prior deposition technologies.] --**

Please substitute the paragraph on lines 31-32 of page 3 thru lines 1-16 of page 4, containing the text:

-- According to another aspect of the present invention, an system for plasma plating is provided that generates a deposition layer on a substrate. The system for plasma plating includes a vacuum chamber at a pressure that extends from 0.1 milliTorr to 4 milliTorr, a filament with an associated depositant located on or in the filament, a platform positioned within the vacuum chamber, a substrate positioned at or on the platform, a dc power supply generating a dc signal at a voltage in a range that extends from 1 volt to 5000 volts, a radio frequency transmitter generating a radio frequency signal at a power level defined by a range that extends from 1 watt to 50 watts, an electrically conductive path that electrically couples the dc signal and the radio

frequency signal to the substrate, and a filament power control electrically coupled to the filament and generating a current through the filament at an amplitude to generate heat in the filament to melt the depositant. --

and insert in its place the following paragraph:

-- According to another aspect of the present invention, a [an] system for plasma plating is provided that generates a deposition layer on a substrate. The system for plasma plating includes a vacuum chamber at a pressure that extends from 0.1 milliTorr to 4 milliTorr, a filament with an associated depositant located on or in the filament, a platform positioned within the vacuum chamber, a substrate positioned at or on the platform, a dc power supply generating a dc signal at a voltage in a range that extends from 1 volt to 5000 volts, a radio frequency transmitter generating a radio frequency signal at a power level defined by a range that extends from 1 watt to 50 watts, an electrically conductive path that electrically couples the dc signal and the radio frequency signal to the substrate, and a filament power control electrically coupled to the filament and generating a current through the filament at an amplitude to generate heat in the filament to melt the depositant. --

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Please substitute the paragraph on page 4, lines 27-33,  
containing the text:

-- Another technical advantage of the present invention includes the capability to efficiently use depositants to minimize the consumption of depositants, which often are expensive precious metals such as gold and even platinum. These efficiencies are achieve through the proper placement of filaments and the use of proper operational parameters. This significantly reduces overall costs. --

and insert in its place the following pargraph:

-- Another technical advantage of the present invention includes the capability to efficiently use depositants to minimize the consumption of depositants, which often are expensive precious metals such as gold and even platinum. These efficiencies are achieved through the proper placement of filaments and the use of proper operational parameters. This significantly reduces overall costs. --

Please substitute the paragraph on page 5, lines 25-31,  
containing the text:

-- Still yet another technical advantage includes the capability plate a substrate with a deposition layer with a thickness that is small enough so as not to change the functional shape of the substrate, such as a bolt, a nut, a fastener, and other components with strict tolerances. The present invention will also work in the presence of an oxidation layer. --

and insert in its place the following paragraph:

-- Still yet another technical advantage includes the capability to plate a substrate with a deposition layer with a thickness that is small enough so as not to change the functional shape of the substrate, such as a bolt, a nut, a fastener [fastner], and other components with strict tolerances. The present invention will also work in the presence of an oxidation layer. --

Please substitute the paragraph on page 8, lines 10-26, containing the text:

-- **FIGURE 1** is a schematic diagram that illustrates a system 10 for plasma plating that can be used to plate any of a variety of materials, according to an embodiment of the present invention. The system 10

includes various equipment used to support the plasma plating of a substrate 12 within a vacuum chamber 14. Once appropriate operating parameters and conditions are achieved, a depositant provided in a filament 16 and a filament 18 may be evaporated or vaporized to form a plasma. The plasma will contain, generally, positively charged ions from the depositant and will be attracted to the substrate 12 where they will form a deposition layer. The plasma may be thought of as a cloud of ions that surround or are located near the substrate 12. The plasma will generally develop a dark region, near the closest surface of the substrate 12 from the filament 12 and the filament 18, that provides acceleration of the positive ions into the substrate 12. --

and insert in its place the following paragraph:

-- **FIGURE 1** is a schematic diagram that illustrates a system 10 for plasma plating that can be used to plate any of a variety of materials, according to an embodiment of the present invention. The system 10 includes various equipment used to support the plasma plating of a substrate 12 within a vacuum chamber 14. Once appropriate operating parameters and conditions are achieved, a depositant provided in a filament 16 and a filament 18 may be evaporated or vaporized to form a plasma. The plasma will contain, generally,



positively charged ions from the depositant and will be attracted to the substrate 12 where they will form a deposition layer. The plasma may be thought of as a cloud of ions that surround or are located near the substrate 12. The plasma will generally develop a dark region, near the closest surface of the substrate 12 from the filament 16 [12] and the filament 18, that provides acceleration of the positive ions [~~into~~] to the substrate 12. --

Please substitute the paragraph on lines 27-32 of page 8, thru lines 1-7, containing the text:

-- The filament 12 and the filament 14 reside within the vacuum chamber 14 along with a platform 20, which supports the substrate 12. A drive assembly 22 is shown coupled between a drive motor 24 and a main shaft of the platform 20 within the vacuum chamber 14. In the embodiment shown in FIGURE 1, the platform 20 is provided as a turntable that rotates within the vacuum chamber 14. The drive assembly 22 mechanically links the rotational motion of the drive motor 24 with the main shaft of the platform 20 to impart rotation to the platform 20. The rotation of the main shaft of the platform 20 is enhanced through various support bearings such as a base plate bearing 28 and a platform bearing 30. --

and insert in its place the following paragraph:

-- The filament 16 [12] and the filament 18 [14] reside within the vacuum chamber 14 along with a platform 20, which supports the substrate 12. A drive assembly 22 is shown coupled between a drive motor 24 and a main shaft of the platform 20 within the vacuum chamber 14. In the embodiment shown in FIGURE 1, the platform 20 is provided as a turntable that rotates within the vacuum chamber 14. The drive assembly 22 mechanically links the rotational motion of the drive motor 24 with the main shaft of the platform 20 to impart rotation to the platform 20. The rotation of the main shaft of the platform 20 is enhanced through various support bearings such as a base plate bearing 28 and a platform bearing 30. --

Please substitute the paragraph on page 10, lines 11-29 containing the text:

-- The filament power control module 34 provides an electric current to the filament 16 and the filament 18. In one embodiment, the filament power control module 34 can provide current to the filament 16 for a particular duration, and then provide current to the filament 18 during a second duration. Depending upon

how the filaments are configured, the filament power control module 34 may provide current to both the filament 16 and the filament 18 at the same time or during separate intervals. This flexibility allows more than one particular depositant material to be plasma plated onto the substrate 12 at different times. The filament power control module 34 preferably provides alternating current to the filaments, but may provide a current using any known method of generating current. In a preferred embodiment, the filament power control module 34 provides current at an amplitude or magnitude that is sufficient to generate enough heat in the filament 16 to evaporate or vaporize the depositant. --

and insert in its place the following paragraph:

-- The filament power control module 34 provides an electric current to the filament 16 and the filament 18. In one embodiment, the filament power control module 34 can provide current to the filament 16 for a particular duration, and then provide current to the filament 18 during a second duration. Depending upon how the filaments are configured, the filament power control module 34 may provide current to both the filament 16 and the filament 18 at the same time or during separate intervals. This flexibility allows more than one particular depositant material to be

plasma plated onto the substrate 12 at different times. The filament power control module 34 preferably provides alternating current to the filaments, but may provide a current using any known method of generating current. In a preferred embodiment, the filament power control module 34 provides current at an amplitude or magnitude that is sufficient to generate enough heat in the filament 16 to evaporate or vaporize the depositant provided therein. --

Please substitute the paragraph on page 13, lines 4-19 containing the text:

-- The remaining equipment and components of the system 10 of FIGURE 1 are used to create, maintain, and control the desired vacuum condition within the vacuum chamber 14. This is achieved through the use of a vacuum system. The vacuum system includes a roughing pump 46 and a roughing valve 48 that is used to initially pull down the pressure in the vacuum chamber 14. The vacuum system also includes a foreline pump 40, a foreline valve 44, a diffusion pump 42, and a main valve 50. The foreline valve 44 is opened so that the foreline pump 40 can began to function. After the diffusion pump 42 is warmed or heated to an appropriate level, the main valve 50 is

opened, after the roughing pump 40 has been shut in by closing the roughing valve 44. This allows the diffusion pump 42 to further reduce the pressure in the vacuum chamber 14 below a desired level. --

and insert in its place the following paragraph:

-- The remaining equipment and components of the system 10 of FIGURE 1 are used to create, maintain, and control the desired vacuum condition within the vacuum chamber 14. This is achieved through the use of a vacuum system. The vacuum system includes a roughing pump 46 and a roughing valve 48 that is used to initially pull down the pressure in the vacuum chamber 14. The vacuum system also includes a foreline pump 40, a foreline valve 44, a diffusion pump 42, and a main valve 50. The foreline valve 44 is opened so that the foreline pump 40 can began to function. After the diffusion pump 42 is warmed or heated to an appropriate level, the main valve 50 is opened, after the roughing pump 46 [40] has been shut in by closing the roughing valve 48 [44]. This allows the diffusion pump 42 to further reduce the pressure in the vacuum chamber 14 below a desired level. --

Please substitute the paragraph on lines 30-33 of page 14, thru lines 1-16 of page 15 containing the text:

-- As described above, the vacuum system includes the roughing pump 46 and the diffusion pump 42, which is used with the foreline pump 40. The roughing pump 46 couples to the vacuum chamber 14 through the roughing valve 48. When the roughing valve 48 is open, the roughing pump 46 may be used to initially reduce the pressure within the vacuum chamber 14. Once a desired lower pressure is achieved within the vacuum chamber 14, the roughing valve 48 is closed. The roughing pump 46 couples to the vacuum chamber 14 through a hole or opening through the base plate 32. The roughing pump 46 will preferably be provided as a mechanical pump. In a preferred embodiment of the vacuum system of the system 10 as shown in FIGURE 1. The vacuum system in this embodiment includes a foreline pump coupled to a diffusion pump 42 through a foreline valve 44. The foreline pump 40 may be implemented as a mechanical pump that is used in combination with the diffusion pump 42 to reduce the pressure within the vacuum chamber 14 to a level even lower than that which was produced through the use of the roughing pump 46. --

and insert in its place the following paragraph:

-- As described above, the vacuum system includes the roughing pump 46 and the diffusion pump 42, which

is used with the foreline pump 40. The roughing pump 46 couples to the vacuum chamber 14 through the roughing valve 48. When the roughing valve 48 is open, the roughing pump 46 may be used to initially reduce the pressure within the vacuum chamber 14. Once a desired lower pressure is achieved within the vacuum chamber 14, the roughing valve 48 is closed. The roughing pump 46 couples to the vacuum chamber 14 through a hole or opening through the base plate 32. The roughing pump 46 will preferably be provided as a mechanical pump. In a preferred embodiment of the vacuum system of the system 10 as shown in FIGURE 1, **[.] [The] the** vacuum system in this embodiment **also** includes a foreline pump **40** coupled to a diffusion pump 42 through a foreline valve 44. The foreline pump 40 may be implemented as a mechanical pump that is used in combination with the diffusion pump 42 to reduce the pressure within the vacuum chamber 14 to a level even lower than that which was produced through the use of the roughing pump 46. --

Please substitute the paragraph on lines 17-33 of page 15 thru lines 1-10 of page 16 containing the text:

-- After the roughing pump has reduced the pressure within the vacuum chamber 14, the diffusion pump 42, which uses heaters and may require the use of cooling

water or some other substance to cool the diffusion pump 42, couples with the vacuum chamber 14 through a main valve 50 and through various holes or openings through the base plate 32 as indicated in FIGURE 1 by the dashed lines above the main valve 50 and below the platform 20. Once the diffusion pump 42 has been heated up and made ready for operation, the main valve 50 may be opened so that the pressure within the vacuum chamber 14 may be further reduced through the action of the diffusion pump 42 in combination with the foreline pump 44. For example, the pressure within the vacuum chamber 14 may be brought below 4 milliTorrr. During a backsputtering process, the pressure in the vacuum chamber 14 may be dropped to a level at or below 100 milliTorrr on down to 20 milliTorrr. Preferably, the pressure within the vacuum chamber 14 during a backsputtering process will be at a level at or below 50 milliTorrr on down to 30 milliTorrr. During normal operation of the system 10 during a plasma plating process, the pressure within the vacuum chamber 14 may be reduced by the vacuum system to a level at or below 4 milliTorrr on down to a value of 0.1 milliTorrr. Preferably, the vacuum system will be used during a plasma plating process to reduce the pressure within the vacuum chamber 14 to a level at or below 1.5 milliTorrr on down to 0.5 milliTorrr.--



and insert in its place the following paragraph:

-- After the roughing pump 46 has reduced the pressure within the vacuum chamber 14, the diffusion pump 42, which uses heaters and may require the use of cooling water or some other substance to cool the diffusion pump 42, couples with the vacuum chamber 14 through a main valve 50 and through various holes or openings through the base plate 32 as indicated in FIGURE 1 by the dashed lines above the main valve 50 and below the platform 20. Once the diffusion pump 42 has been heated up and made ready for operation, the main valve 50 may be opened so that the pressure within the vacuum chamber 14 may be further reduced through the action of the diffusion pump 42 in combination with the foreline pump 44. For example, the pressure within the vacuum chamber 14 may be brought below 4 milliTorrr. During a backsputtering process, the pressure in the vacuum chamber 14 may be dropped to a level at or below 100 milliTorrr on down to 20 milliTorrr. Preferably, the pressure within the vacuum chamber 14 during a backsputtering process will be at a level at or below 50 milliTorrr on down to 30 milliTorrr. During normal operation of the system 10 during a plasma plating process, the pressure within the vacuum chamber 14 may be reduced by the vacuum system to a level at or below 4 milliTorrr on down to a value of 0.1 milliTorrr. Preferably, the vacuum

system will be used during a plasma plating process to reduce the pressure within the vacuum chamber 14 to a level at or below 1.5 milliTorr on down to 0.5 milliTorr.--

Please substitute the paragraph on lines 26-32 of page 18, thru lines 1-15 of page 19 containing the text:

-- **FIGURE 3** is a side view that illustrates the formation and dispersion of a plasma around a filament 100 to plasma plate a substrate 12 according to an embodiment of the present invention. The filament 100 is implemented as a wire basket, such as tungsten wire basket, and is shown with a depositant 102 located, and mechanically supported, within the filament 100. As the filament power control module 34 provides sufficient current to the filament 100, the depositant 102 melts or vaporizes and a plasma 104 is formed. Of course, all of the operating parameters of the present invention must be present in order to achieve the plasma state so that plasma plating may takes place.--

and insert in its place the following paragraph:

-- **FIGURE 3** is a side view that illustrates the formation and dispersion of a plasma around a filament 100 to plasma plate a substrate 12 according to an

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embodiment of the present invention. The filament 100 is implemented as a wire basket, such as tungsten wire basket, and is shown with a depositant 102 located within, and mechanically supported by, [within] the filament 100. As the filament power control module 34 provides sufficient current to the filament 100, the depositant 102 melts or vaporizes and a plasma 104 is formed. Of course, all of the operating parameters of the present invention must be present in order to achieve the plasma state so that plasma plating may take[s] place.--

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## **EXHIBIT B**

1. **(Three Times Amended)** A method for plasma plating comprising:

positioning a substrate with a threaded surface within a vacuum chamber;

positioning a depositant in an evaporation source within the vacuum chamber, the depositant includes at least a first metal;

reducing an initial pressure in the vacuum chamber to at or below 4 milliTorr;

flowing a gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 0.1 milliTorr and 4 milliTorr;

applying a negative dc signal to the substrate at a voltage amplitude at or between 1 volt and 5000 volts;

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts; and

heating the depositant to a temperature at or above the melting point of the depositant, whereby a plasma is generated in the vacuum chamber, [which] the plasma includes a mixture of positively charged depositant ions and n gatively charged electrons, and the depositant ions are plated on [a] the threaded surface

of the substrate to create a plated threaded surface,  
and wherein the plated threaded surface reduces  
galling between the plated threaded surface and a  
surface of a mated component.

2. (Twice Amended) The method of Claim 1, wherein  
[reducing] the initial pressure is reduced in the vacuum chamber  
to [at or below 4 milliTorr includes reducing the pressure in  
the vacuum chamber to] at or below 1.5 milliTorr, and wherein  
[flowing a] gas is flowed through the vacuum chamber at a rate  
to raise the pressure in the vacuum chamber to [at or between  
0.1 milliTorr and 4 milliTorr includes flowing the gas through  
the vacuum chamber at a rate to raise the pressure in the vacuum  
chamber to] at or between 0.5 milliTorr and 1.5 milliTorr.

3. (Twice Amended) The method of Claim 1, wherein  
[applying] the negative dc signal is applied to the substrate at  
a voltage amplitude [at or between 1 volt and 5000 volts  
includes applying a negative dc signal to the substrate at a  
voltage amplitude] at or between negative 500 volts and negative  
750 volts.

7. **(Twice Amended)** The method of Claim 1, wherein **[reducing]** the initial pressure is reduced in the vacuum chamber to at or below **[4 milliTorr includes reducing the initial pressure in the vacuum chamber to at or below]** 1.5 milliTorr, and **[flowing]** the gas is flowed through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between **[0.1 milliTorr and 4 milliTorr includes flowing the gas through the vacuum chamber at a rate to raise the pressure to at or between]** 0.5 milliTorr and 1.5 milliTorr, wherein **[applying]** a negative dc signal is applied to the substrate at a voltage amplitude at or between **[1 volt and 5000 volts includes applying a negative dc signal to the substrate at a voltage amplitude at or between]** negative 500 volts and negative 750 volts, and wherein the power level is provided at or between 5 and 15 watts.

13. **(Amended)** The method of Claim 12, wherein **[applying the dc signal to the substrate and applying the radio frequency signal to the substrate include applying]** the dc signal and the radio frequency signal are applied to the electrically conductive material of the turntable using a commutator.

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14. **(Amended)** The method of Claim 12, wherein **[applying the dc signal to the substrate and applying the radio frequency signal to the substrate include applying]** the dc signal and the radio frequency signal are applied to the electrically conductive material of the turntable using an electrically conductive brush.

27. **(Amended)** The method of Claim 1, further comprising: mixing the dc signal and the radio frequency signal to generate a mixed signal, and wherein **[applying]** the dc signal **[to the substrate and applying]** and the radio frequency signal **[to the substrate]** includes applying the mixed signal to the substrate.



52. **(Three Times Amended)** The method of Claim 1, further comprising:

positioning a second depositant in a second evaporation

source within the vacuum chamber before reducing the

initial pressure in the vacuum chamber to at or below

4 milliTorr; and

heating the second depositant to at or above the melting

point of the second depositant, whereby a second

plasma is generated in the vacuum chamber, **[which] the**

second plasma includes a mixture of positively charged

second depositant ions and negatively charged

electrons, and the second depositant ions are plated

on the threaded surface of the substrate **[that was**

**plated with the depositant ions]**.

54. **(Three Times Amended)** The method of Claim 52, further comprising:

positioning a third depositant in a third evaporation

source within the vacuum chamber before reducing the

initial pressure in the vacuum chamber to at or below

4 milliTorr; and

heating the third depositant to a temperature at or above

the melting point of the third depositant, whereby a

third plasma is generated in the vacuum chamber,

**[which] the third plasma** includes a mixture of

positively charged third depositant ions and

negatively charged electrons, and the third depositant

ions are plated on the substrate **[surface of the**

**substrate that was plated with the second depositant**

**ions]**.

64. **(Amended)** The method of Claim 62 **[63]**, wherein  
cleaning the substrate includes cleaning the substrate to meet a  
defined standard **[the standard is]** defined by Steel Structures  
Painting Council (SSPC).

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65. **(Amended)** The method of Claim 64 [63], wherein the standard is SSPC-5.

66. **(Amended)** The method of Claim 64 [63], wherein the standard is SSPC-10.

69. **(Cancel)** The method of Claim 1, wherein the depositant is a metal.

83. **(Cancel)** The method of Claim 1, wherein the depositant is a nonmetal

84. **(Cancel)** The method of Claim 1, wherein the depositant is a ceramic.

102. **(Twice Amended)** The method of Claim 1, wherein the gas is argon and the depositant [despositant] is a metal alloy of silver/palladium, and the plasma includes argon ions and silver/palladium ions.

118. **(Amended)** The method of Claim 1, wherein the plasma forms a layer on the substrate **[with] to create the plated threaded surface at** a thickness at or between 500 and 20,000 Angstroms.

119. **(Amended)** The method of Claim 1, wherein the plasma forms a layer on the substrate **[with] to create the plated threaded surface at** a thickness at or between 3,000 and 10,000 Angstroms.

120. **(Amended)** The method of Claim 1, wherein the plasma forms a layer on the substrate **to create the plated threaded surface** that can be controlled to a thickness of 500 Angstroms.

121. **(Amended)** The method of Claim 1, further comprising:  
backsputtering the substrate before heating the depositant  
to a temperature at or above the melting point of the  
depositant **[to generate a plasma in the vacuum  
chamber]**.

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122. **(Twice Amended)** The method of Claim 1, further comprising:

performing backsputtering before heating the depositant that includes:

reducing the pressure in the vacuum chamber to at or below 100 milliTorr;

flowing a gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber to at or between 20 milliTorr and 100 milliTorr;

applying a dc signal to the substrate at a voltage amplitude at or between 1 volt and 4000 volts;

and

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts.

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123. **(Twice Amended)** The method of Claim 122, wherein reducing the pressure in the vacuum chamber **[to at or below 100 milliTorr]** includes reducing the pressure in the vacuum chamber to at or below 50 milliTorr, and wherein flowing the gas through the vacuum chamber at a rate to raise the pressure in the vacuum chamber **to** at or between 20 milliTorr and 100 milliTorr includes flowing the gas through the vacuum chamber at a rate to raise the pressure **to** at or between 20 milliTorr and 50 milliTorr.

125. **(Twice Amended)** The method of Claim 122, wherein applying the radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts includes applying the radio frequency signal at a [the] power level [is provided] at or between 5 and 15 watts.

129. **(Three Times Amended)** A method for plasma plating comprising:

positioning a substrate with a threaded surface within a vacuum chamber;

positioning a depositant in the vacuum chamber;

reducing an initial pressure in the vacuum chamber to at or between 0.5 milliTorr and 1.5 milliTorr;

applying a negative dc signal to the substrate at a voltage amplitude at or between 500 volts and 750 volts;

applying a radio frequency signal to the substrate at a power level at or between 1 watt and 50 watts; and

heating the depositant to a temperature at or above the melting point of the depositant, whereby a plasma is generated in the vacuum chamber, **[which] the plasma** includes a mixture of positively charged depositant ions and **negatively charged** electrons, and the depositant ions are plated on **[a] the threaded** surface of the substrate **to create a plated threaded surface,** **and wherein the plated threaded surface reduces** **galling between the plated threaded surface and a** **surface of a mated component.**

æl\ n (14c) 1 archaic : COMMONWEALTH

also, welth\ n (15c) 1 archaic : COMMON-  
e, or other political unit: as a : one founded  
pact or tacit agreement of the people for the  
in which supreme authority is vested in the  
cap a : the English state from the death of  
restoration in 1660 b : PROTECTORATE 1b  
used officially of Kentucky, Massachusetts  
ia 5 cap : a federal union of constituent  
of Australia 6 often cap : an association of  
is states more or less loosely associated in  
the British crown 7 often cap : a political  
my but voluntarily united with the U.S.  
ico and of the Northern Mariana islands  
58) : May 24 observed in parts of the British  
iversary of Queen Victoria's birthday  
: a calendar year containing no intercalary

n [ME, fr. MF, fr. L *commotio* - *commotio*,  
novēre] (15c) 1 : a condition of civil unrest  
or recurrent motion 3 : mental excitement  
agitated disturbance : TO DO b : noisy confu-

com-moved; com-mov-ing [ME *commo* - *com-*  
tem of *commovire*, fr. L *commovere*, fr. com-  
y) 1 : to move violently : AGITATE 2 : to  
xite to passion  
kām-yōn-'v\ adj [F, fr. LL *communis*, fr.  
or relating to one or more communes 2 :  
y 3 a : characterized by collective own-  
b : participated in, shared, or used in com-  
roup or community 4 : of, relating to,  
groups — com-mu-nal-ly -v\ adv  
n (1871) 1 : social organization on a com-  
a sociopolitical grouping based on religion  
mu-nal-ist -v\ -t-ist n or adj  
nal-at-ē n, pl -ties (1901) 1 : commun-  
eling of group solidarity  
-l-iz, 'kām-yōn- v\ -l-ized; -l-izing (1881)

r(d) n [F] (1874) 1 cap : one who su-  
he Commune of Paris in 1871 2 : a person

com-muned; com-mun-ing [ME *commun* to  
munion, fr. MF *communier* to converse, ad-  
union, fr. LL *communicare*, fr. L] vi, obs (15c)  
ive more to — Shak. ~ vi 1 : to receiv-  
unicate intimately (~ with nature)  
'myūn, kām- n [F, alter. of MF *commune*, fr.  
t. pl. of *communis*] (1673) 1 : the smallest  
nary countries esp. in Europe 2 : COMMON  
as a : a medieval usu. municipal corpora-  
often rural community organized on a com-

ni-kā-bal\ adj (14c) 1 : capable of being  
ITABLE (~ disease) 2 : COMMUNICATIVE  
-ni-kā-'bil-at-ē n — com-mu-ni-ca-ble-  
com-mu-ni-ca-bly -v\ adv

ant\ n (1552) 1 : a church member entitled  
to be a member of a fellowship 2 : one  
: INFORMANT — communicant adj  
-kāi\ vb -cat-ed; -cat-ing [L *communicare*,  
part. participare, fr. *communis* common]

1 archaic : SHARE 2 a : to convey know-  
to : make known (~ a story) b : to reveal  
unmunicated itself to his friends 3 : to cause  
r (some diseases are easily communicat-  
ed) 4 : to transmit information  
is satisfactory received or understood (3)  
: CONNECT (the rooms ~) — com-mu-ni-

-cator 'myūn-nā-kāt-ē n, pl -cators  
-nā-kā-shōn\ n (14c) 1 : an act or instan-  
e of information communicated 2 : a verbal  
process by which information is exchange-  
gh a common system of symbols, signs, or  
phorones in insect ~; also : exchange of  
rapport (a lack of ~ between old and young  
sm (as of telephones) for communicating  
iving troops, supplies, and vehicles c :  
neciating 5 pl but sing or pl in constr. a :  
deas effectively (as in speech) b : the trans-  
y of information (as by the printed word)

-mu-ni-ca-tion-al -shōn, -shōn-'v\ adj  
-nā-kāt-iv, -ni-kāt-iv\ adj (1654) 1 :  
KATIVE 2 : of or relating to communica-  
-com-mu-ni-ca-tive-ness n

-ni-kā-tōr-ē, -tōr-ē\ adj (1646) 1 :  
ormation (~ letters) 2 : COMMUNICATIVE  
\ n [ME, fr. L *communicatio*, *communio* *mu-*  
nūti] (14c) 1 : an act or instance of shar-  
in a sacrament in which bread and wine  
ration of the death of Christ b : the ac-  
e cap : the part of the Mass in which the  
ap : a variable verse of Scripture tradit-  
uring the people's communion — called as  
imate fellowship or rapport : COMMUNIO-  
ians having a common faith and disciplin-

78) : a Sunday (as the first Sunday of  
stant church regularly holds a Communion

-kā, -myūn-nā- n [F, fr. pp. of *commun-*  
communicare] (1852) : BULLETIN 1 :  
2 : a newspaper or journal published by a  
3 : a periodical or journal published by a  
4 : a newspaper or journal published by a  
5 : a periodical or journal published by a

6 : a newspaper or journal published by a  
7 : a periodical or journal published by a  
8 : a newspaper or journal published by a  
9 : a periodical or journal published by a  
10 : a newspaper or journal published by a

11 : a newspaper or journal published by a  
12 : a periodical or journal published by a  
13 : a newspaper or journal published by a  
14 : a periodical or journal published by a  
15 : a newspaper or journal published by a

16 : a newspaper or journal published by a  
17 : a periodical or journal published by a  
18 : a newspaper or journal published by a  
19 : a periodical or journal published by a  
20 : a newspaper or journal published by a

21 : a newspaper or journal published by a  
22 : a periodical or journal published by a  
23 : a newspaper or journal published by a  
24 : a periodical or journal published by a  
25 : a newspaper or journal published by a

com-mu-nism 'kām-yō-niz-əm\ n [F *communisme*, fr. *commun-*  
mon] (1840) 1 a : a theory advocating elimination of private prop-  
erty; b : a system in which goods are owned in common and are avail-  
able to all as needed 2 cap a : a doctrine based on revolutionary  
Marxian socialism and Marxism-Leninism that is the official ideology  
of the U.S.S.R. b : a totalitarian system of government in which a  
single authoritarian party controls state-owned means of production  
with the professed aim of establishing a stateless society c : a final  
stage of society in Marxist theory in which the state has withered away  
and economic goods are distributed equitably

com-mu-nist 'kām-yō-nist\ n (1840) 1 : an adherent or advocate of  
communism 2 cap : COMMUNARD 3 a cap : a member of a Commu-  
nist party or movement b often cap : an adherent or advocate of a  
Communist government, party, or movement 4 often cap : one held  
to engage in left-wing, subversive, or revolutionary activities — com-  
mu-nist adj, often cap — com-mu-nis-tic 'kām-yō-nis-tik\ adj, often cap

com-mu-nis-ti-cal-ly -v\ -ti-k(-ə)-lē\ adv  
com-mu-ni-tar-ian 'kō-myū-nā-'ter-ē-ən\ adj (ca. 1909) : of or relating  
to social organization in small cooperative partially collectivist com-  
munities — communitarian n — com-mu-ni-tar-ian-ism -v\ -ē-ə-niz-əm\

n  
com-mu-ni-ty 'kō-myū-nət-ē\ n, pl -ties [ME *comune*, fr. MF *comu-*  
neté, fr. L *communiat* - *communis*, fr. *communis*] (14c) 1 : a unified  
body of individuals: as a : STATE, COMMONWEALTH b : the people with  
common interests living in a particular area; broadly : the area itself  
(the problems of a large ~) c : an interacting population of various  
kinds of individuals (as species) in a common location d : a group of  
people with a common characteristic or interest living together within a  
larger society (a ~ of retired persons) e : a group linked by a com-  
mon policy f : a body of persons or nations having a common history  
or common social, economic, and political interests (the international  
~); g : a body of persons of common and esp. professional interests  
scattered through a larger society (the academic ~) 2 : society at  
large 3 a : joint ownership or participation (~ of goods) b : com-  
mon character : LIKENESS (~ of interests) c : social activity : FEL-  
LOWSHIP d : a social state or condition

community antenna television n (1953) : CABLE TELEVISION  
community center n (1915) : a building or group of buildings for a com-  
munity's educational and recreational activities  
community chest n (1919) : a general fund accumulated from individual  
subscriptions to defray demands on a community for charity and social  
welfare

community college n (1948) : a nonresidential 2-year college that is usu-  
ally government-supported  
community property n (ca. 1925) : property held jointly by husband  
and wife

com-mu-nize 'kām-yō-niz\ v\ -nized; -niz-ing [back-formation fr. *com-*  
munitization] (1888) 1 a : to make common b : to make into state-  
owned property 2 : to subject to Communist principles of organiza-  
tion — com-mu-ni-za-tion 'kām-yō-nā-zā-shōn\ n  
com-mu-ni-ty 'kām-yō-tāt\ v\ -tāt-ed; -tāt-ing [back-formation fr. *com-*  
munitation] (1890) : to reverse every other half cycle of (an alternating  
current) so as to form a unidirectional current

com-mu-ta-tion 'kām-yō-tā-shōn\ n [ME, fr. MF, fr. L *commutatio* -  
commutatio, fr. *commutatus*, pp. of *commutare*] (15c) 1 : EXCHANGE,  
TRADE 2 : REPLACEMENT; specif. : a substitution of one form of payment  
for charge for another 3 : a change of a legal penalty or punishment to  
a lesser one 4 : an act or process of commuting 5 : the action of  
commuting

commutation ticket n (1848) : a transportation ticket sold for a fixed  
number of trips over the same route during a limited period  
com-mu-ta-tive 'kām-yō-tāt-iv, kō-myū-tīt-at\ adj (ca. 1755) 1 : of,  
relating to, or showing commutation 2 : of, relating to, or character-  
ized by the combination of elements of a given set under a specified  
operation in such a manner that the result is independent of the order  
in which the elements are taken (a ~ group) (addition of the positive  
integers is ~)

com-mu-ta-tiv-ity 'kō-myū-tāt-iv-ē, 'kām-yō-tā-ē\ n (1929) : the  
property of being commutative (the ~ of a mathematical operation)  
com-mu-tat-ory 'kām-yō-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

com-mu-tate 'kō-myū-t\ v\ com-mut-ed; com-mut-ing [L *commutare* to  
change, exchange, fr. com- + *mutare* to change — more at MISS] vt  
(15c) 1 a : CHANGE, ALTER b : to give in exchange for another : EX-  
CHANGE 2 : to convert (as a payment) into another form 3 : to ex-  
change (a penalty) for another less severe 4 : COMMUTATE ~ vi 1  
to make up; COMPENSATE 2 : to pay in gross 3 : to travel back and  
forth regularly (as between a suburb and a city) 4 : to yield the same  
mathematical result regardless of order — used of two elements under-  
going an operation or of two operations on elements — com-mut-able

com-mu-tat-ory 'kō-myū-tāt-ōr-ē\ n (1839) 1 : a switch for reversing the  
direction of an electric current 2 : a series of bars or segments so  
connected that the current flows in a continuous loop (the ~ of an armature  
coil in conjunction with fixed brushes result in unidirectional current  
output in the case of a generator and in the reversal of the current into  
the case of a motor) 3 : an element of a mathematical  
group that when multiplied by the product of two given elements yields  
the product of the elements in reverse order

out excess flesh 3 : being a metric space with the property that for  
any collection of open sets which contains it there is a subset of the  
collection with a finite number of elements which also contains it —  
com-pact-ly adv — com-pact-ness n

com-pact vi (15c) 1 : to make up by connecting or combining : COM-  
POSE 2 a : to knit or draw together : COMBINE b : to press together  
: COMPRESS ~ vi : to become compacted — com-pact-ible -v\ -pak-tā-  
bəl, -pak- v\ adj — com-pac-tor also com-pacter -v\ -pak-tā-  
r, -pak- n

com-pact 'kām-pakt\ n (1601) 1 : something that is compact or com-  
pacted : a : a small cosmetic case (as for compressed powder) b : an  
automobile smaller than an intermediate but larger than a subcompact  
com-pact 'kām-pakt\ n [L *compactum*, fr. neut. of *compactus*, pp. of  
*compacisci* to make an agreement, fr. com- + *pacisci* to contract —  
more at PACT] (1591) : an agreement or covenant between two or more  
parties

compact disc n (1980) : a small plastic optical disc usu. containing re-  
corded music  
com-pac-tion 'kām-pak-shən, kām- v\ n (14c) : the act or process of com-  
pacting : the state of being compacted

com-pan-ion 'kām-pan-yōn\ n [ME *compainoun*, fr. OF *compagnon*, fr.  
LL *companion*, *companion*, fr. L com- + *panis* bread, food — more at  
FOOD] (13c) 1 : one that accompanies another : COMRADE, ASSOCIATE  
2 obs : RASCAL 3 a : one that is closely connected with something  
similar b : one employed to live with and serve another

companion vi (1622) : ACCOMPANY ~ vi : to keep company  
companion n [by folk etymology fr. D *kampanje* poop deck] (1762) 1  
: a hood covering at the top of a companionway 2 : COMPANIONWAY  
com-pan-ion-able 'kām-pan-yō-nā-bal\ adj (14c) : marked by, conduc-  
tive to, or suggestive of companionship : SOCIABLE — com-pan-ion-able-  
ness n — com-pan-ion-ably -v\ -ble\ adv

com-pan-ion-ate 'kām-pan-yō-nāt\ adj (1926) : relating to or having the  
manner of companions; specif. : harmoniously or suitably accompany-  
ing

companionate marriage n (1927) : a proposed form of marriage in  
which legalized birth control would be practiced, the divorce of child-  
less couples by mutual consent permitted, and neither party would  
have any financial or economic claim on the other

companion cell n (1887) : a living nucleated cell that is closely associ-  
ated in origin, position, and probably function with a cell making up  
part of a sieve tube of a vascular plant

companion piece n (1844) : a work (as of literature) that is associated  
with and complements another  
com-pan-ion-ship 'kām-pan-yōn-ship\ n (1548) : the fellowship existing  
among companions

com-pan-ion-way 'yōn-wā\ n [*companion*] (1840) : a ship's stairway  
from one deck to another

com-pany 'kām-p(-ə)-nē\ n, pl -nies often attrib [ME *compagnie*, fr. OF  
*compagnie*, fr. *compain* companion, fr. LL *companion*] (13c) 1 a : as-  
sociation with another : FELLOWSHIP (enjoy a person's ~) b : COM-  
PANIONS, ASSOCIATES (know a person by the ~ he keeps) c : VISITORS,  
GUESTS (having ~ for dinner) 2 a : a group of persons or things (a ~  
of horsemen) b : a body of soldiers; specif. : a unit (as of infantry)  
consisting usu. of a headquarters and two or more platoons c : an  
organization of performing artists d : the officers and men of a ship  
e : a fire-fighting unit 3 a : a chartered commercial organization or  
medieval trade guild b : an association of persons for carrying on a  
commercial or industrial enterprise c : those members of a partnership  
firm whose names do not appear in the firm name (John Doe and  
Company)

com-pany vi -nied; -ny-ing (14c) : ACCOMPANY (may ... fair winds ~  
your safe return — John Massfield) ~ vi : ASSOCIATE  
company officer n (1844) : a commissioned officer in the army, air  
force, or marine corps of the rank of captain, first lieutenant, or second  
lieutenant — called also *company grade officer*; compare *FIELD OFFICER*,  
*GENERAL OFFICER*

company town n (1927) : a community that is dependent on one firm for  
all or most of the necessary services or functions of town life (as em-  
ployment, housing, and stores)

company union n (1917) : an unaffiliated labor union of the employees  
of a single firm; esp. : one dominated by the employer  
com-para-bil-ity 'kām-p(-ə)-rā-'bil-at-ē, -kām-p(-ə)-rā- v\ n (1843) : the  
quality or state of being comparable

com-para-ble 'kām-p(-ə)-rā-bal, -kām-p(-ə)-rā-bal\ adj (15c) 1 : capa-  
ble of or suitable for comparison 2 : EQUIVALENT, SIMILAR (fabrics of  
~ quality) — com-para-ble-ness n — com-para-bly -v\ -ble\ adv

com-par-a-tist 'kām-par-āt-ist\ n [*comparative* + -ist] (1933) : one that  
uses a comparative method (as in the study of literature)

com-par-a-tive 'kām-par-āt-iv\ adj (15c) 1 : of, relating to, or consti-  
tuting the degree of comparison in a language that denotes increase in  
the quality, quantity, or relation expressed by an adjective or adverb  
2 : considered as if in comparison to something else as a standard not  
quite attained : RELATIVE (a ~ stranger) 3 : characterized by system-  
atic comparison esp. of likenesses and dissimilarities (~ anatomy) —  
com-par-a-tive-ly adv — com-par-a-tive-ness n

comparative n (15c) 1 a : one that compares with another esp. on  
equal footing : RIVAL b : one that makes witty or mocking compar-  
isons 2 : the comparative degree or form in a language

com-par-a-tiv-ist 'kām-par-āt-iv-ist\ n (1887) : COMPARATIST  
com-par-a-tor 'kām-par-āt-ōr\ n (1883) : a device for comparing some-  
thing with a similar thing or with a standard measure

com-pare 'kām-pa(-r), -p(-ə)-r\ v\ com-pared; com-par-ing [ME *com-*  
pare, fr. MF *comparer*, fr. L *comparare* to couple, compare, fr. *com-*  
par like, fr. com- + *par* equal] vt (14c) 1 : to represent as similar : LIKEN  
2 : to examine the character or qualities of esp. in order to discover  
resemblances or differences 3 : to inflict or modify (an adjective or

about \ə\ kitten, F table \tə\ further \ə\ ash \æ\ ace \ā\ cot, cart  
\a\ out \ə\ chin \tʃ\ bet \et\ easy \e\ hit \ɪ\ hit \ɪ\ ice \i\ job  
\j\ sing \ɪ\ go \o\ law \o\ boy \ɔ\ thin \θ\ the \ð\ loot \u\ foot  
\f\ yet \z\ vision \ə\ k, ʃ, æ, ɛ, ɪ, ɒ, ʊ, see Guide to Pronunciation

Defenition of Commutator

DEFINITION OF COMMUTATOR



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